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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the loudspeaker equipment which an acoustic signal (sound signal) is supplied and performs a sound reproduction.

[0002]

[Description of the Prior Art] Conventionally, the loudspeaker equipment which plays music etc. was constituted as shown in drawing 9 . That is, in drawing 9 , 1 shows a magnetic circuit and this magnetic circuit 1 consists of a magnet 2, a yoke 3, and top plate 4 grade. And the coil bobbin 6 with which the voice coil 7 was looped around between the senter pole 5 of the center section of the yoke 3 and the top plate 4 is arranged, and the center dome 8 is fixed to the upper limit of this coil bobbin 6. And the center section of the cone 9 is fixed to the upper-limit section of the coil bobbin 6, and the periphery section of a cone 9 is attached in a frame 10. Moreover, the end of a damper 11 is connected to the coil bobbin 6, and the other end of this damper 11 is connected to a frame 10. In addition, the magnetic circuit 1 matched with the magnet 2 for the periphery side of a voice coil 7 in this way is called an outside \*\* type magnetic circuit.

[0003] Thus, with being constituted, the coil bobbin 6 vibrates according to the driving signal supplied to a voice coil 7, a cone 9 vibrates with this coil bobbin 6, and the voice based on the sound signal supplied to a voice coil 7 is reproduced.

[0004] In addition, although illustration is not carried out, the same of a principle is said of the loudspeaker which consisted of inner \*\* type magnetic circuits matched for the inner circumference side of the coil bobbin with which the voice coil was looped around with the magnet.

[0005]

[Problem(s) to be Solved by the Invention] By the way, as shown in drawing 9 , the driving force which a diaphragm vibrates is strong, and the direction which two or more magnetic circuits and voice coils were prepared [ direction ], and vibrated one diaphragm by two or more of these voice coils rather than the case where a voice coil is made to drive by the single magnetic circuit is advantageous from points, such as an output level of the voice reproduced. However, when two or more magnetic circuits were simply prepared in

the single loudspeaker unit, two or more magnets etc. will exist and there was un-arranging [ which increases the size and weight of a loudspeaker unit ].

[0006] Moreover, having un-arranged [ to which a weight also becomes heavy ], while also enlarging such a loudspeaker, since two or more magnetic circuits existed in the single unit, although there were some which improved the frequency characteristic etc. in the single loudspeaker unit as arranged two or more diaphragms (the horn for loud sounds, cone for low-pitched sound, etc.) to the shape for example, of the same axle and were made to drive each of this diaphragm by the individual magnetic circuit.

[0007] this invention aims at offering the loudspeaker equipment which can drive a diaphragm equivalent to the case where two or more magnetic circuits only by the single magnetic circuit are prepared in view of these points.

[0008]

[Means for Solving the Problem] As shown in drawing 1 , the 1st invention (it corresponds to the 1st example) A diaphragm 9, In the loudspeaker equipment which has the coil bobbin 25 with which the voice coil was looped around and the diaphragm 9 was connected with the upper part, and the magnetic circuit 20 allotted near this coil bobbin 25 In the magnet 21 arranged on the periphery section of the coil bobbin 25, the 1st plate 22 arranged on the upper part of this magnet 21, the 2nd plate 23 arranged on the lower part of a magnet 21, and the yoke 24 arranged on the inner circumference section of the coil bobbin 25 While constituting a magnetic circuit 20 and making the coil bobbin 25 between the 1st plate 22 and a yoke 24 loop around the 1st voice coil 26 as a voice coil It is made to make the coil bobbin 25 between the 2nd plate 23 and a yoke 24 loop around the 2nd voice coil 27.

[0009] Moreover, as shown in drawing 3 , the 2nd invention (it corresponds to the 2nd example) In the loudspeaker equipment which has a diaphragm 12, the coil bobbin 35 with which the voice coil was looped around and the diaphragm 12 was connected with the upper part, and the magnetic circuit 30 allotted near this coil bobbin 35 In the magnet 34 arranged on the inner circumference section of the coil bobbin 35, the 1st plate 32 arranged on the upper part of this magnet 34, the 2nd plate 33 arranged on the lower part of a magnet 34, and the yoke 34 arranged on the periphery section of the coil bobbin 35 While constituting a magnetic circuit 30 and looping the coil bobbin 35 between the 1st plate 32 and a yoke 34 around the 1st voice coil 36 as a voice coil The coil bobbin 35 between the 2nd plate 33 and a yoke 34 is looped around the 2nd voice coil 37.

[0010] Moreover, as shown in drawing 5 , the 3rd invention (it corresponds to the 3rd example) The 1st and 2nd diaphragms 12 and 15, and the 1st and the 2nd coil bobbin 35 and 41 with which the voice coil was looped around and each diaphragm was connected with the upper part, In the loudspeaker equipment which has the magnetic circuit 30 allotted near these the 1st and 2nd coil bobbins 35 and 41 The magnet 31 arranged on the 1st and 2nd inner circumference or peripheries of the coil bobbins 35 and 41, By 1st plate 32' allotted to the upper part of this magnet 31, the 2nd plate 33 arranged on the magnetic lower part, and yoke 34' allotted to the 1st and 2nd peripheries or inner circumference of the coil bobbins 35 and 41 In the 1st coil bobbin 35 which was made to constitute a

magnetic circuit 30 and was connected with the 1st diaphragm 12 The 1st voice coil 37 located between the 2nd plate 33 and yoke 34' is looped around, and the 2nd coil bobbin 41 connected with the 2nd diaphragm 15 is looped around the 2nd voice coil 42 located between 1st plate 32' and yoke 34'.

[0011] Moreover, as shown in drawing 6 , the 4th invention (it corresponds to the 4th example) The 1st and 2nd diaphragms 12 and 15, and the 1st and the 2nd coil bobbin 35 and 41 with which the voice coil was looped around and each diaphragm was connected with the upper part, In the loudspeaker equipment which has the magnetic circuit 30 allotted near these the 1st and 2nd coil bobbins 35 and 41 The magnet 31 arranged on the 1st and 2nd inner circumference or peripheries of the coil bobbins 35 and 41, In 1st plate 32' allotted to the upper part of this magnet 31, the 2nd plate 33 arranged on the magnetic lower part, and the yoke 34 arranged on the 1st and 2nd peripheries or inner circumference of the coil bobbins 35 and 41 The 1st voice coil 36 located between 1st plate 32' and a yoke 34 at the 1st coil bobbin 35 which constituted the magnetic circuit 30 and was connected with the 1st diaphragm 12, The 2nd voice coil 37 located between the 2nd plate 33 and a yoke 34 is looped around, and the 2nd coil bobbin 41 connected with the 2nd diaphragm 15 is looped around the 3rd voice coil 42 located between 1st plate 32' and a yoke 34.

[0012] Moreover, as shown in drawing 7 , the 5th invention (it corresponds to the 5th example) The 1st and 2nd diaphragms 12 and 17, and the 1st and the 2nd coil bobbin 35 and 55 with which the voice coil was looped around and each diaphragm was connected with the upper part, In the loudspeaker equipment which has the magnetic circuit 50 allotted near these the 1st and 2nd coil bobbins 35 and 55 The magnet 51 arranged on the periphery of the 2nd coil bobbin 55 by the inner circumference of the 1st coil bobbin 35, The 1st plate 52 arranged on the upper part of this magnet 51, and the 2nd plate 53 arranged on the lower part of a magnet 51, In the 1st yoke 34 arranged on the periphery of the 1st coil bobbin 35, and the 2nd yoke 54 arranged on the inner circumference of the 2nd coil bobbin 55 The 1st voice coil 36 located between the 1st plate 52 and the 1st yoke 34 at the 1st coil bobbin 35 which constituted the magnetic circuit 50 and was connected with the 1st diaphragm 12, The 2nd voice coil 37 located between the 2nd plate 53 and the 1st yoke 34 is looped around. The 2nd coil bobbin 55 connected with the 2nd diaphragm 17 is looped around the 3rd voice coil 56 located between the 1st plate 52 and the 2nd yoke 54, and the 4th voice coil 57 located between the 2nd plate 53 and the 2nd yoke 54.

[0013]

[Function] According to the 1st invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the outside of a coil bobbin, by the voice coil being allotted to this two magnetic opening, respectively, two voice coils drive by the single magnetic circuit, and the drive efficiency of the diaphragm connected so much to the coil bobbin becomes high.

[0014] Moreover, according to the 2nd invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged inside the coil bobbin, by the voice coil being allotted to this two magnetic opening,

respectively, two voice coils drive by the single magnetic circuit, and the drive efficiency of the diaphragm connected so much to the coil bobbin becomes high.

[0015] Moreover, according to the 3rd invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the inside or the outside of a coil bobbin, by another voice coil connected with the respectively different diaphragm at this two magnetic opening being allotted, the drive of the diaphragm of two sheets is performed by the single magnetic circuit, and-izing of the magnetic circuit can be carried out [ \*\*\*\* ].

[0016] Moreover, according to the 4th invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the inside or the outside of a coil bobbin. By two voice coils connected with the 1st diaphragm being allotted to this two magnetic opening While the drive efficiency of this 1st diaphragm becomes high, by being allotted to one magnetic opening, one voice coil connected with the 2nd diaphragm is also driven simultaneously, and this 2nd diaphragm can also carry out [ \*\*\*\* ]-izing of the magnetic circuit.

[0017] Moreover, according to the 5th invention, a magnetic opening is formed in each of the inside of the plate of the magnetic upper and lower sides and the outside which constitute a magnetic circuit, by the voice coil connected with another diaphragm at each magnetic opening being allotted, the drive of the diaphragm of two sheets is performed by the single magnetic circuit, and-izing of the magnetic circuit can be carried out [ \*\*\*\* ].

[0018]

[Example] Hereafter, the 1st example of this invention is explained with reference to drawing 1 and drawing 2 . In this drawing 1 and drawing 2 , the same sign is given to the portion corresponding to drawing 9 , and the detailed explanation is omitted.

[0019] Drawing 1 is drawing showing the loudspeaker equipment of this example in a cross section, and let the loudspeaker equipment of this example be the loudspeaker unit which used the outside \*\* type magnetic circuit. That is, in drawing 1 , 20 shows a magnetic circuit and has the plates 22 and 23 of the upper and lower sides of a magnet 21 and this magnet 21 as a component part of this magnetic circuit 20. This magnet 21 and plates 22 and 23 are annularly arranged on the circumference of the coil bobbin 25. And the yoke 24 of a cylindrical shape is arranged on the inner circumference side of the coil bobbin 25. And the coil bobbin 25 between the upside plate 22 and a yoke 24 is looped around the 1st voice coil 26, and is looped around the 2nd voice coil 27 in the coil bobbin 25 between the lower plate 23 and a yoke 24. Each of this voice coil 26 and 27 makes reverse mutually the sense around which the coil bobbin 25 is made to loop, and supplies the same sound signal. And the circumference of a magnetic circuit 20 is covered with covering 28.

[0020] And the upper limit of the coil bobbin 25 is connected to the edge of the cone 9 which is a diaphragm, and the center dome 8 is attached in the upper limit of the coil bobbin 25. Moreover, the coil bobbin 25 is made to support to a frame 10 side through a damper 11.

[0021] Thus, according to the magnetic circuit 20 of the loudspeaker unit constituted, as

shown in drawing 2 , magnetic flux occurs. Supposing it has omitted the voice coil and the coil bobbin, for example, the magnet 21 bottom is N pole and the bottom is the south pole, this drawing 2 While the magnetic flux shown with a dashed line (magnet 21 -> plate 22 -> yoke 24 -> plate 23 -> magnet 21) occurs, a magnetic opening is formed between the upside plate 22 and a yoke 24 and magnetic flux  $\phi_1$  arises in the meantime A magnetic opening is formed between the lower plate 23 and a yoke 24, and it is magnetic flux  $\phi_2$  in the meantime. It is generated.

[0022] And this magnetic flux  $\phi_1$  A voice coil 26 is allotted to the magnetic opening to produce, and it is magnetic flux  $\phi_2$ . Since the voice coil 27 is allotted to the magnetic opening to produce, the coil bobbin 25 with which voice coils 26 and 27 were looped around based on the sound signal supplied to both the voice coils 26 and 27 vibrates, the cone 9 attached in the coil bobbin 25 vibrates, and the audio output based on vibration is performed.

[0023] Thus, the drive of a cone 9 performed is magnetic flux  $\phi_1$  and  $\phi_2$ . Since it is based on 2 sets of voice coils 26 and 27 allotted to the magnetic opening to produce, the drive of an efficient diaphragm (cone 9) is performed compared with the drive only by 1 set of voice coils. And although it is the composition of having formed only 1 set of magnetic circuits 20, 2 sets of voice coils 26 and 27 drive, and it is not necessary to prepare 2 sets of magnetic circuits, and a loudspeaker unit can be constituted so much small and lightweight in this example.

[0024] Next, the 2nd example of this invention is explained with reference to drawing 3 and drawing 4 .

[0025] Drawing 3 is drawing showing the loudspeaker equipment of this example in a cross section, and let the loudspeaker equipment of this example be the loudspeaker unit which used the inner \*\* type magnetic circuit. That is, in drawing 3 , 30 shows a magnetic circuit and has the plates 32 and 33 of the upper and lower sides of a magnet 31 and this magnet 31 as a component part of this magnetic circuit 30. This magnet 31 and plates 32 and 33 are arranged on the interior of the coil bobbin 35 in the shape of a cylinder. And the annular yoke 34 is arranged on the periphery side of the coil bobbin 35. And the coil bobbin 35 between the upside plate 32 and a yoke 34 is looped around the 1st voice coil 36, and is looped around the 2nd voice coil 37 in the coil bobbin 35 between the lower plate 33 and a yoke 34. Each of this voice coil 36 and 37 makes reverse mutually the sense around which the coil bobbin 35 is made to loop, and supplies the same sound signal. And the circumference of the wrap yoke 34 is covered for the coil bobbin 35 with covering 38.

[0026] And the upper limit of the coil bobbin 35 is connected to the edge of the cone 12 which is a diaphragm, and the center dome 13 is attached in the upper limit of the coil bobbin 35. Moreover, the coil bobbin 35 is made to support to a frame 10 side through a damper 11.

[0027] Thus, according to the magnetic circuit 30 of the loudspeaker unit constituted, as shown in drawing 4 , magnetic flux occurs. Supposing it has omitted the voice coil and the coil bobbin, for example, the magnet 31 bottom is N pole and the bottom is the south pole, this drawing 4 While the magnetic flux shown with a dashed line (magnet 31 -> plate 32 ->

yoke 34 -> plate 33 -> magnet 31) occurs, a magnetic opening is formed between the upside plate 32 and a yoke 34 and magnetic flux  $\phi_3$  arises in the meantime. A magnetic opening is formed between the lower plate 33 and a yoke 34, and it is magnetic flux  $\phi_4$  in the meantime. It is generated.

[0028] And this magnetic flux  $\phi_3$ . A voice coil 36 is allotted to the magnetic opening to produce, and it is magnetic flux  $\phi_4$ . Since the voice coil 37 is allotted to the magnetic opening to produce, the coil bobbin 35 with which voice coils 36 and 37 were looped around based on the sound signal supplied to both the voice coils 36 and 37 vibrates, the cone 12 attached in the coil bobbin 35 vibrates, and the audio output based on vibration is performed.

[0029] Thus, the drive of a cone 12 performed is magnetic flux  $\phi_3$  and  $\phi_4$ . Since it is based on 2 sets of voice coils 36 and 37 allotted to the magnetic opening to produce, compared with the drive only by 1 set of voice coils, the drive of an efficient diaphragm (cone 12) is performed like the example of drawing 1. And although it is the composition of having formed only 1 set of magnetic circuits 30, 2 sets of voice coils 36 and 37 drive, and it is not necessary to prepare 2 sets of magnetic circuits, and a loudspeaker unit can be constituted so much small and lightweight in this example.

[0030] Next, the 3rd example of this invention is explained with reference to drawing 5. In this drawing 5, the same sign is given to the portion corresponding to drawing 3 explained in the 2nd example mentioned above, and the detailed explanation is omitted.

[0031] Drawing 5 is drawing showing the loudspeaker equipment of this example in a cross section, and let the loudspeaker equipment of this example be the loudspeaker unit which makes two diaphragms drive using 1 set of inner \*\* type magnetic circuits. That is, the diaphragm which becomes the center section of the diaphragm which consists of a cone 12 in this example from a dome 15 is arranged, and it can be made to perform voice reproduction by vibration of a cone 12, and voice reproduction by vibration of a dome 15. In this case, the thing of the quality of the material which passes sound, such as a mesh-like cheesecloth, is used as a center dome 14 connected with the center section of the cone 12, and the voice by vibration of a dome 15 is made to be outputted out of a loudspeaker unit.

[0032] And although a magnetic circuit 30 is arranged inside the coil bobbin 35 connected with the cone 12, the coil bobbin 35 is made to loop only around the voice coil 37 which approached with the plate 33 of the magnet 31 bottom in this example, and upper plate 32' and the coil bobbin 35 which approached are not made to loop around a voice coil. And plate 32' of a magnetic-circuit 30 top is made into a minor diameter a little than the lower plate 33, it connects with a dome 15, and the coil bobbin [ minor diameter / bobbin / coil / 35 ] a little / 41 is arranged to the inner circumference of the coil bobbin 35. In this case, this coil bobbin 41 is arranged only between upper plate 32' and a yoke 34, and is not extended up to the lower plate 33 and the approaching position. And the coil bobbin 41 between plate 32' and a yoke 34 is made to loop around a voice coil 42. Moreover, a dome 15 is made to support to a plate 32' side through a damper 16.

[0033] Other portions are constituted like the 2nd example shown in drawing 3.

[0034] Thus, according to the loudspeaker unit constituted, since it is the same as the 2nd example, while magnetic flux occurs as a dashed line shows to drawing 4, a magnetic opening is formed between the upside plate 32 (32') and a yoke 34 and magnetic flux  $\phi_3$  arises in the meantime, a magnetic opening is formed between the lower plate 33 and a yoke 34, and magnetic-circuit 30 the very thing is magnetic flux  $\phi_4$  in the meantime. It is generated.

[0035] And magnetic flux  $\phi_3$  Since the voice coil 42 is allotted to the magnetic opening to produce, the coil bobbin 41 with which the voice coil 42 was looped around based on the sound signal supplied to a voice coil 42 vibrates, the dome 15 attached in the coil bobbin 41 vibrates, and the audio output based on vibration is performed. Furthermore, magnetic flux  $\phi_4$  Since the voice coil 37 is allotted to the magnetic opening to produce, the coil bobbin 35 with which the voice coil 37 was looped around based on the sound signal supplied to a voice coil 37 vibrates, the cone 12 attached in the coil bobbin 35 vibrates, and the audio output based on vibration is performed.

[0036] Here, low-pass sound is outputted by vibration of a cone 12, and by vibration of a dome 15, high \*\*\*\* is outputted and it consists of supplying the low-pass component of a sound signal to the voice coil 37 which vibrates a cone 12, and supplying the high-frequency component of a sound signal to the voice coil 42 which vibrates a dome 15 as a two so-called way type loudspeaker.

[0037] And since the cone 12 in this case and the drive of a dome 15 are based on 1 set of magnetic circuits 30, they do not need to prepare 2 sets of magnetic circuits, and can constitute a loudspeaker unit small and lightweight so much.

[0038] Next, the 4th example of this invention is explained with reference to drawing 6. In this drawing 6, the same sign is given to the portion corresponding to drawing 5 explained in the drawing 3 explained in the 2nd example mentioned above, and 3rd examples, and the detailed explanation is omitted.

[0039] Drawing 6 is drawing showing the loudspeaker equipment of this example in a cross section, and the loudspeaker equipment of this example is the loudspeaker unit it was made to make two diaphragms drive using 1 set of inner \*\* type magnetic circuits like the 3rd example mentioned above. That is, the diaphragm which becomes the center section of the diaphragm which consists of a cone 12 from a dome 15 is arranged, and it can be made to perform voice reproduction by vibration of a cone 12, and voice reproduction by vibration of a dome 15.

[0040] And the coil bobbin 35 connected with the cone 12 is made to loop around 2 sets of voice coils 36 and 37 in this example. That is, plate 32' of a magnetic-circuit 30 top and the position which approached are made to loop around a voice coil 36, and the lower plate 33 and the position which approached are made to loop around a voice coil 37. In this case, both the voice coils 36 and 37 make the looping-around direction reverse mutually, and supply the same sound signal. And plate 32' of the coil bobbin 41 connected with the dome 15 and the position which approached are made to loop around a voice coil 42. Therefore, between upper plate 32' and the yoke 34, 2 sets of voice coils 36 and 42 will be allotted.

[0041] Other portions are constituted like the 3rd example shown in drawing 5 .

[0042] Thus, according to the loudspeaker unit constituted, since it is the same as the 2nd example, as a dashed line shows to drawing 4 , magnetic flux is carried out, a magnetic opening is formed between the upside plate 32 (32') and a yoke 34, and magnetic-circuit 30 the very thing is magnetic flux  $\phi_3$  in the meantime. While being generated, a magnetic opening is formed between the lower plate 33 and a yoke 34, and it is magnetic flux  $\phi_4$  in the meantime. It is generated.

[0043] And this magnetic flux  $\phi_3$  A voice coil 36 is allotted to the magnetic opening to produce, and it is magnetic flux  $\phi_4$ . Since the voice coil 37 is allotted to the magnetic opening to produce, the coil bobbin 35 with which voice coils 36 and 37 were looped around based on the sound signal supplied to both the voice coils 36 and 37 vibrates, the cone 12 attached in the coil bobbin 35 vibrates, and the audio output based on vibration is performed. Furthermore, magnetic flux  $\phi_3$  Since the voice coil 42 is allotted to the magnetic opening to produce, the coil bobbin 41 with which the voice coil 42 was looped around based on the sound signal supplied to a voice coil 42 vibrates, the dome 15 attached in the coil bobbin 41 vibrates, and the audio output based on vibration is performed.

[0044] Here, low-pass sound is outputted by vibration of a cone 12, and by vibration of a dome 15, high \*\*\*\* is outputted and it consists of supplying the low-pass component of a sound signal to the voice coils 36 and 37 which vibrate a cone 12, and supplying the high-frequency component of a sound signal to the voice coil 42 which vibrates a dome 15 as a two so-called way type loudspeaker.

[0045] And since the cone 12 in this case and the drive of a dome 15 are based on 1 set of magnetic circuits 30, they do not need to prepare 2 sets of magnetic circuits, and can constitute a loudspeaker unit small and lightweight so much. Moreover, in the case of this 4th example, since the vibration by the side of a cone 12 is due to 2 sets of voice coils 36 and 37, the drive of an efficient diaphragm (cone 12) is performed.

[0046] Next, the 5th example of this invention is explained with reference to drawing 7 and drawing 8 . In this drawing 7 and drawing 8 , the same sign is given to the portion corresponding to drawing 3 explained in the 2nd example mentioned above, and the detailed explanation is omitted.

[0047] Drawing 7 is drawing showing the loudspeaker equipment of this example in a cross section, and the loudspeaker equipment of this example is the loudspeaker unit it was made to make two diaphragms drive using 1 set of magnetic circuits. That is, the diaphragm which becomes the center section of the diaphragm which consists of a cone 12 from a dome 17 is arranged, and it can be made to perform voice reproduction by vibration of a cone 12, and voice reproduction by vibration of a dome 17.

[0048] Explanation of this composition arranges the magnetic circuit 50 constituted from an annular magnet 51 and annular plates 52 and 53 of the upper and lower sides of this magnet 51 by the inner circumference section of the coil bobbin 35 connected with the cone 12. And while making the coil bobbin 35 between a plate 52 and a yoke 34 loop around a voice coil 36, the coil bobbin 35 between a plate 53 and a yoke 34 is made to



loop around a voice coil 37.

[0049] And the coil bobbin 55 connected with the dome 17 in the center section of the magnetic circuit 50 formed annularly is arranged. In this case, a dome 17 and the coil bobbin 55 are made to support to a plate 52 side through a damper 18. And the yoke 54 of a cylindrical shape is arranged in the inner circumference section of the coil bobbin 55. And while making the coil bobbin 55 between a plate 52 and a yoke 54 loop around a voice coil 56, the coil bobbin 55 between a plate 53 and a yoke 54 is made to loop around a voice coil 57. In addition, as for a yoke 54 or a magnetic circuit 50, the position is fixed by the wrap covering 39 from an outside in near [ this / whole ]. Moreover, the thing of the quality of the material which passes sound, such as a mesh-like cheesecloth, is used as a center dome 14 connected with the center section of the cone 12, and the voice by vibration of a dome 17 is made to be outputted out of a loudspeaker unit.

[0050] Other portions are constituted like the 4th example shown in drawing 6.

[0051] Thus, according to the magnetic circuit 50 of the loudspeaker unit constituted, as shown in drawing 8, magnetic flux occurs. For example, magnetic flux  $\phi 5$  shown between the yokes 34 of a periphery with a dashed line (magnet 51  $\rightarrow$  plate 52  $\rightarrow$  yoke 34  $\rightarrow$  plate 53  $\rightarrow$  magnet 51) supposing the magnet 51 bottom is N pole and the bottom is the south pole While generating and forming a magnetic opening between the upside plate 52 and a yoke 34, a magnetic opening is formed between the lower plate 53 and a yoke 34. Moreover, magnetic flux  $\phi 6$  shown between the yokes 54 of inner circumference with a dashed line (magnet 51  $\rightarrow$  plate 52  $\rightarrow$  yoke 54  $\rightarrow$  plate 53  $\rightarrow$  magnet 51) While generating and forming a magnetic opening between the upside plate 52 and a yoke 54, a magnetic opening is formed between the lower plate 53 and a yoke 54.

[0052] And magnetic flux  $\phi 5$  by the side of a periphery Since voice coils 36 and 37 are allotted to the magnetic opening to depend, the coil bobbin 35 with which voice coils 36 and 37 were looped around based on the sound signal supplied to voice coils 36 and 37 vibrates, the cone 12 attached in the coil bobbin 35 vibrates, and the audio output based on vibration is performed.

[0053] Moreover, magnetic flux  $\phi 6$  by the side of inner circumference Since voice coils 56 and 57 are allotted to the magnetic opening to depend, the coil bobbin 55 with which voice coils 56 and 57 were looped around based on the sound signal supplied to voice coils 56 and 57 vibrates, the dome 17 attached in the coil bobbin 55 vibrates, and the audio output based on vibration is performed.

[0054] Here, low-pass sound is outputted by vibration of a cone 12, and by vibration of a dome 17, high \*\*\*\* is outputted and it consists of supplying the low-pass component of a sound signal to the voice coils 36 and 37 which vibrate a cone 12, and supplying the high-frequency component of a sound signal to the voice coils 56 and 57 which vibrate a dome 17 as a two so-called way type loudspeaker.

[0055] And since the cone 12 in this case and the drive of a dome 17 are based on 1 set of magnetic circuits 50, they do not need to prepare 2 sets of magnetic circuits, and can constitute a loudspeaker unit small and lightweight so much. Furthermore, in the case of this 5th example, since the drive by the side of a cone 12 and the drive of a dome 17 are

based on 2 sets of voice coils 36 and 37, and 56 and 57, respectively, the drive of an efficient diaphragm (a cone 12 and dome 17) is performed.

[0056]

[Effect of the Invention] According to the 1st invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the outside of a coil bobbin, by the voice coil being allotted to this two magnetic opening, respectively, two voice coils drive by the single magnetic circuit, and the drive efficiency of the diaphragm connected so much to the coil bobbin becomes high.

[0057] Moreover, according to the 2nd invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged inside the coil bobbin, by the voice coil being allotted to this two magnetic opening, respectively, two voice coils drive by the single magnetic circuit, and the drive efficiency of the diaphragm connected so much to the coil bobbin becomes high.

[0058] Moreover, according to the 3rd invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the inside or the outside of a coil bobbin, by another voice coil connected with the respectively different diaphragm at this two magnetic opening being allotted, the drive of the diaphragm of two sheets is performed by the single magnetic circuit, and-izing of the magnetic circuit can be carried out [ \*\*\*\* ].

[0059] Moreover, according to the 4th invention, two magnetic openings are formed between the plates of the magnetic upper and lower sides and yokes which were arranged on the inside or the outside of a coil bobbin. By two voice coils connected with the 1st diaphragm being allotted to this two magnetic opening While the drive efficiency of this 1st diaphragm becomes high, by being allotted to one magnetic opening, one voice coil connected with the 2nd diaphragm is also driven simultaneously, and this 2nd diaphragm can also carry out [ \*\*\*\* ]-izing of the magnetic circuit.

[0060] Moreover, according to the 5th invention, a magnetic opening is formed in each of the inside of the plate of the magnetic upper and lower sides and the outside which constitute a magnetic circuit, by the voice coil connected with another diaphragm at each magnetic opening being allotted, the drive of the diaphragm of two sheets is efficiently performed by the single magnetic circuit, and-izing of the magnetic circuit can be carried out [ \*\*\*\* ].

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[Translation done.]